How Food-Secure Primates Make Choices About Food

At What Point Do *Rhesus Macaques* Abandon the Principles of the Optimal Foraging Theory for Their Personal Preference?

By Rachel Knoebl and Sydney Walsh

Introduction

- Primates have apparent preferences regarding specific foods (1).
- Food choices are made based on two contributing factors: the nutrition content, and availability within its environment (3).
- According to the Optimal Foraging Theory, these particular factors are based on obtaining the most useful energy to sustain metabolism and perform physical activities, all while conserving energy as well.
- With this evolutionary built-in decision making system, it would be predicted that a primate, when given several options, will pick a food or collection of foods that contain more calories and essential nutrients.
- This experiment explores whether captive Rhesus Macaques, who are secure in their food source, correspond with Optimal Foraging Theory behaviors, or base their food choices solely off preference. It ultimately explores the role of food security and its influence on innate evolutionary systems controlling diet.

Preference Testing

- Created a personal food hierarchy based on the six foods presented to NHP's. Two arrangements were used for presentation.
- After 10 trials were performed, the ranks were averaged for each food and scores were assigned to each food.

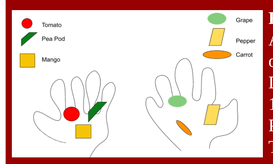

Figure 1: Arrangement of Food During Trial 1 of Preference Testing.

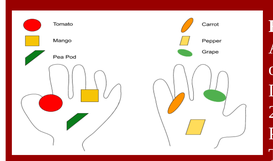

Figure 2: Arrangement of Food During Trial 2 of Preference Testing.

Choice Analysis

- Using the calculated scores, the NHPs were then presented with five different trials, each trial presenting one piece of their favorite food with several pieces of lower-ranked foods in order to assess the strength of their preference.
  - Trial 1 (Control): 1 vs Stevia
  - Trial 2: 1 vs 3 pieces of 6
  - Trial 3: 1 vs 4 pieces of 2
  - Trial 4: 1 vs 1 piece of 2 and 3
  - Trial 5: 1 vs 2 pieces of 3 and 4
  - Trial 6: 1 vs 3 pieces of 5 and 6
- Stevia Cubes were used as a control, in order to evaluate if preferences were based on sweetness.

Results

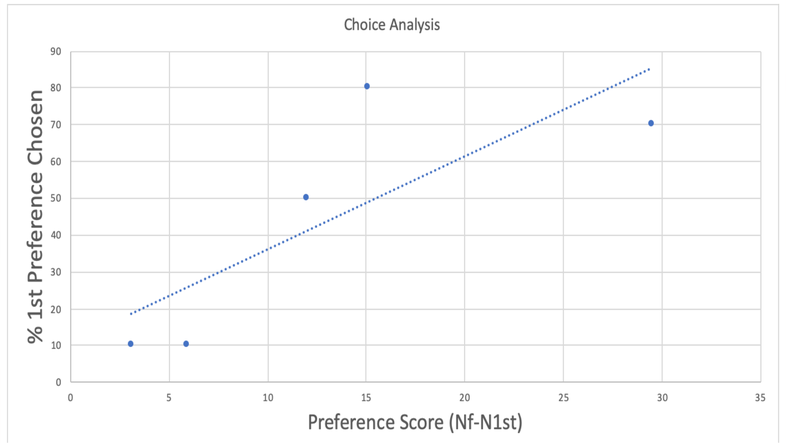

Figure 3: Choice Analysis of NHP who opted for preference over quantity. Preference score (on the x-axis) is a subtraction of scores of the foods presented (non preferential choices summed) minus the score of the top preference. High score=not preferred. R-value=0.7936 and P=0.109.

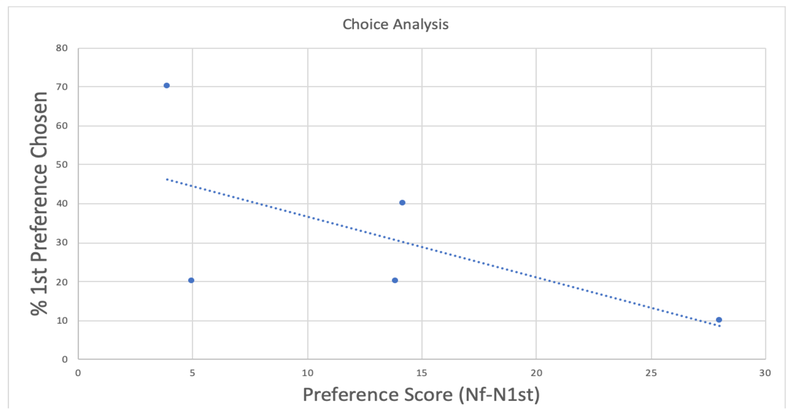

Figure 4: Choice Analysis of NHP who opted for quantity over preference. Preference score (on the x-axis) is a subtraction of scores of the foods presented (non preferential choices summed) minus the score of the top preference. High score=not preferred. R-value=-0.6291 and P=0.2555

- To create figures, a preference score that took a summation of scores of foods presented (non-preference side total score), minus the score of the 1st preference was calculated.
- This score was then plotted against the number of times the NHP chose their top preference over the other choice presented in each trial (% chosen).
- Using the scores, presented options were weighted in order to evaluate the strength of preference.

Conclusions

- The results are indicative of the individuality of nutrition that exists in all living beings.
  - Some subjects opted for calories, others for taste. No data was identical.
- Nutrition is something that cannot have a specific protocol or method that is perfect for all living beings; its a personal endeavor that can be altered by life experiences, size, environment, physical activity, etc.
- For some individuals, the evolutionarily innate impulse of opting for calorie dense foods can change, but it is still the primary motivation for other individuals, corresponding with the Optimal Foraging Theory.

Future Directions

- An individual's food security status may ultimately change the way they perceive food. The impact that food security has on the choices primates (including humans) make about food, as well as the evolution of taste, can be analyzed.
- It is known through evolution that quantitative nutritional needs are different among living beings, depending on size, temperature, physical activity, and other factors. The individuality of nutrition can be further studied to understand how body size, environment and activity can impact food choices of primates.
- An ever-evolving taste ability has allowed primates, like Rhesus Macaques and humans, to develop the ability to identify nutrients, which is useful for the estimated one billion individuals currently living with food insecurity, as it may be possible to maximize nutritional intake with the assistance of taste (4).

References

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